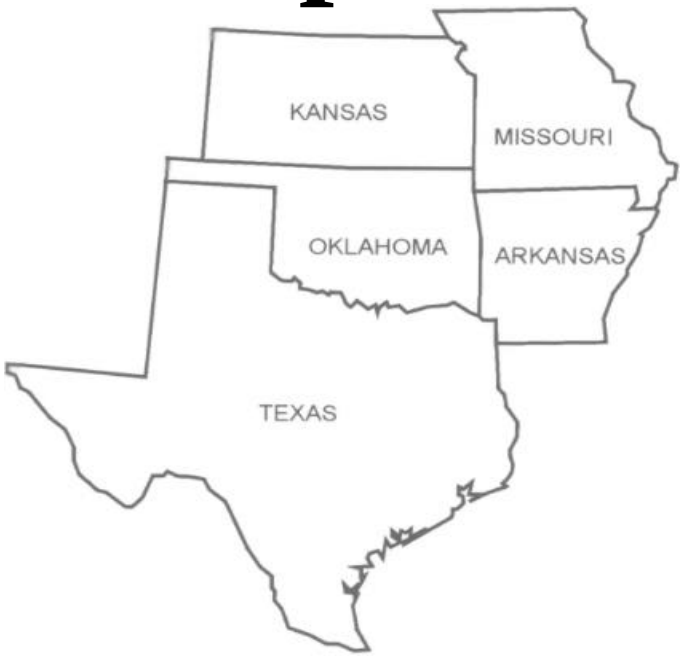
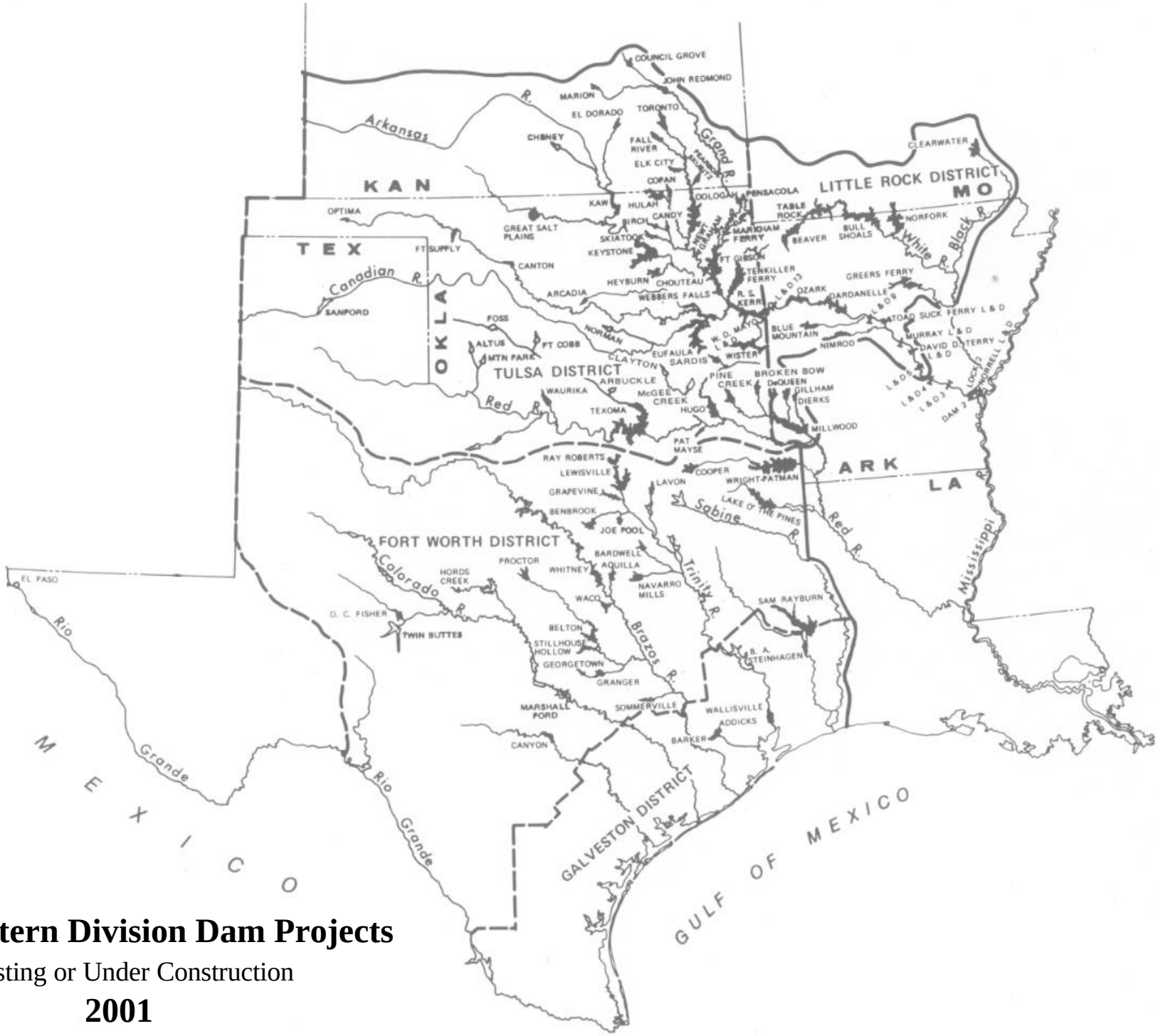
US Army Corps
Of Engineers
Southwestern Division
Reservoir Control Center

FY 2001 Annual Water Quality Report



February 2002

FOR OFFICIAL USE ONLY



Southwestern Division Dam Projects

Existing or Under Construction

2001

(With Section 7 Flood Control Projects Added)

FY 2001

ANNUAL WATER QUALITY REPORT

RESERVOIR CONTROL CENTER

SOUTHWESTERN DIVISION

TABLE OF CONTENTS

TABLE OF CONTENTS
CONTINUED

TABLE OF CONTENTS
CONTINUED

PAGE

Tables

SECTION I

INTRODUCTION

SECTION I – INTRODUCTION

PURPOSE OF REPORT. This report presents activities and accomplishments of the districts within Southwestern Division (SWD) as related to water quality management activities throughout FY01. Detailed summaries of water quality activities are also included.

This report is prepared in conformance ER 1130-2-234, Reporting of Water Quality Management Activities.

SECTION II

WATER QUALITY ACTIVITIES
IN FORT WORTH DISTRICT

SECTION II - WATER QUALITY ACTIVITIES IN FORT WORTH DISTRICT

1. Program Summary and Responsibilities.

The Fort Worth District has an intensive water-quality sampling program on 9 out of 25 district lakes. During the fiscal year 2001, two detailed water quality reports for Bardwell and Whitney Lakes were completed and forwarded to the Southwestern Division for review and approval. These reports were also furnished to those water storage contractors who have a need for this information.

2. Goals..

Water quality monitoring and evaluation are essential components of the Fort Worth District's water quality program. It is designed to assess the water quality of selected Fort Worth District lakes and to accomplish the following basic objectives.

a. Establish base-line conditions at these projects.
b. Identify water quality problems and resolve those problems where possible.
c. Gather monthly dissolved oxygen and temperature data to be used for thermal simulation modeling of lake projects during the design or modification stages to determine multilevel outlet sizing and location.
d. To evaluate annual water-quality trends and to establish the magnitude of natural annual variations.

3. Organization and Staff..

Presently, the Fort Worth District's water quality staff consists of one full-time and one part-time hydraulic engineer. District personnel involved in water quality work are listed in Table 1.

Table 1
Fort Worth District
Water Quality Staff

Name	Org. Code	Title	Phone #.	FAX #	Gra	Exp. YRS
Shah Khan	CESWF-OD-L	Hydraulic Engineer	817-978-8474	8-2176	GS-12	11
Paul Lauderdale	CESWF-OD-L	Hydraulic Engineer	817-978-3134	8-2176	GS-11	2

4. Sampling Program.

The Fort Worth District has an intensive water-quality sampling program on 9 out of 25 district lakes. The monitored lakes during the fiscal year 2001 were Lavon, Cooper, Navarro Mills, Somerville, Bardwell, Grapevine, Waco, Whitney, and Lake O' the Pines. The Fort Worth District, under its intensive sampling program, monitors the condition of lakes, upstream and downstream. Evaluation of the water quality data is based on water quality standards and criteria established by the Texas Natural Resource Conservation Commission (TNRCC), and the U.S. Environmental Protection Agency (USEPA), as well as other states quality standards which are designed to protect key beneficial uses. The water quality parameters that are monitored include biological, physical, chemical, temperature, and dissolved oxygen. The USGS, the Engineer Research and Development Center (ERDC), and other established labs are used to analyze these samples. The data collected are stored in the USEPA database "STORET" and in the USGS database "National Water Information System" (NWIS). The data are published yearly in the USGS Water Resources Data publications. Statistical analyses are performed on about 40 water quality parameters. Our office coordinates with the above mentioned agencies and river authorities during the interpretation phase of the collected data. We also obtain permitted wastewater loading reports in Texas rivers from TNRCC, which we use in our water quality analyses.

5. Training.

During the fiscal year 2001, one of the water quality team members attended the Engineer Research and Development Center's (ERDC) workshop on water quality management and restoration using settling basins, wetlands, and other watershed BMPs held at the Radisson Hotel, St. Paul, MN during July 10-12, 2001. The team members will be scheduled for more water quality modeling and management courses as time and funds are available.

6. Research and Development Needs.

None are anticipated during the next FY.

7. Assistance from Committees or Outside Sources.

No assistance was requested in the FY 2001.

8. Project Narratives.

On March 4, 2001, 19 freight cars of the Union Pacific Railroad (UPRR) derailed on a bridge crossing the Jennings Slough, which is a seasonal tributary to Sulphur River, which flows to Wright Patman Lake. One of the derailed hopper cars released a processed form of coal tar pitch known as pencil pitch to the slough and the floodwaters. Pencil pitch is a dry, black, approximately 0.5 inch diameter cylinder up to four inches long that contains semivolatile organic compounds and polynuclear aromatic hydrocarbons (PAHs).

The environmental assessment of surface water quality began on March 4, 2001 when surface water samples were collected in the vicinity of the derailment and in Wright Patman Lake. Analytical test results indicated that pencil pitch could leach under laboratory conditions. Although several constituents were reported in the surface water samples above detection limits, only one sample, collected from the Wright Patman Lake Spillway on March 9, 2001, reported an exceedance for Benzo (a) pyrene of the TNRCC standards. Benzo (a) pyrene exceeded to 0.00021 mg/l at the spillway, slightly higher than the TNRCC protective contamination limit (PCL) of 0.0002 mg/l. The pencil pitch cleanup operation began on July 24, 2001 and it was completed on August 24, 2001 to the satisfaction of the U.S. Army Corps of Engineers and the TNRCC. A total of 732.25 tons of pencil pitch was removed and disposed at the Waste Management, Inc. landfill in New Boston, Texas.

During the first week of February 2001, fish kill was observed at Possum Kingdom Reservoir (approximately 170,000 fish), Lake Granbury (approximately 10,000 to 15,000 fish) and the Corp of Engineers Lake Whitney (approximately 3,000 fish). The Brazos River Authority (BRA) and the Texas Parks and Wildlife Department's (TPWD) staff have related fish kills to bio-toxic blooms of the golden alga (prymnesiophyta or chrysophyta) Prymnesium parvum. The TPWD fish kill specialists are unsure as to what event or series of events may have triggered the algae blooms or how long the blooms will persist.

Phytoplankton samples collected within the Whitney Lake on February 12, 2001 by the USGS for the Corp of Engineers at sites P11 (upstream of the lake below Nolan River confluence) and AC (about a mile upstream of the dam) indicated high concentrations of prymnesium

parvum (35,158.6 cells/ml or 29.5% of the total population) at site P11 and none at site AC. Spring samples collected on May 22, 2001 detected very low concentrations (0.2% and 0.4%) of prymnesium parvum at sites P11 and AC, respectively. Phytoplankton data collected for the period February 1999 to July 2000 did not detect any prymnesium parvum. High concentration of golden alga prymnesium parvum detected at site P11 during February 12, 2001 sampling by the USGS are in line with the TPWD findings.

Since the experts on phytoplankton are not sure what triggers the bloom of prymnesium parvum, research is needed in this field. Presently the Texas A&M University, the BRA and the TPWD are in the process of requesting funding for this research which will be in the millions of dollars.

From the data available, we found no major water quality problems in any of the Fort Worth District projects, which are sampled intensively.

SECTION III

WATER QUALITY ACTIVITIES IN GALVESTON DISTRICT

SECTION III - WATER CONTROL ACTIVITIES IN GALVESTON DISTRICT

1. Program Summary and Responsibilities.

Water Quality investigations for proposed projects are conducted in the Planning Division. Project specific, activities range from water and sediment sampling with basic insitu analysis to groundwater and soil borings collection. Associated laboratory analyses varies from basic parameters to a full range of Priority Pollutants. The Planning Division also conducts water quality activities for project maintenance. Work generally consists of water, sediment and elutriates analysis prior to dredging.

2. Goals.

Water quality research and activities are primarily focused on water quality impact analysis, maintenance of navigational waterways and flood control projects. District goals include maintaining state standards while minimizing water quality impacts, and maximizing environmentally beneficial uses of dredge material.

3. Organization and Staff.

District personnel involved in water quality work are listed in Table 2.

Table 2
Galveston District
Water Quality Staff

Name	Org. Code	Title	Phone #.	FAX #	Gra.	Exp. YRS
Kristy Morten	CESWG-PE-PR	Biologist	409-766-3045	3064	GS-11	22
Dave McLintock	CESWG-PE-PR	Environmental Specialist	409-766-3131	3034	GS-12	19
Robert Hauch	CESWG-PE-PR	Physical Scientist	409-766-3913	3064	GS-12	20

4. Sampling Program.

Water quality activities are conducted on as –needed basis for new projects and waterway maintenance dredging. The District does not have regular water quality monitoring programs.

5. Training.

Training and workshops are attended as needed to maintain level of competency. Training needs include watershed management and other TMDL related issues.

6. Research and Development Needs.

None are anticipated in the next FY.

7. Assistance from Committees or Outside Sources.

No assistance was requested this FY.

8. Project Narratives.

The Galveston District does not own or operate standard water storage reservoirs or lakes. As such, the District does not conduct routine water quality monitoring programs. The District manages two flood control reservoirs, Addicks Reservoir and Barker Reservoir, in Houston, Texas. Designed to store floodwaters, the reservoirs are dry the majority of the year and support various recreational uses.

SECTION IV

WATER QUALITY ACTIVITIES IN LITTLE ROCK DISTRICT

SECTION IV - WATER QUALITY ACTIVITIES IN LITTLE ROCK DISTRICT

1. Program Summary and Responsibilities.

The District water quality management programs are divided among the Operations Division and the Planning, Environmental, and Regulatory Division by functional missions. A water quality specialist from the Reservoir Control Branch is the District Point of Contact responsible for coordinating water quality matters within the District. Responsibility for water quality studies within the Divisions are assigned the various elements based on the nature of the study. Specific activities of the Divisions are discussed under Section 4., Sampling Program.

2. Goals.

- **a.** Manage water releases from reservoirs to best balance water quality needs with project purposes.
- **b.** Identify existing & potential reservoir water quality related problems & take appropriate actions consistent with our mission & authority.
- **c.** Provide safe drinking water for public use.
- **d.** Provide safe swimming areas following state health regulations.
- **e.** Ensure Corps' project compliance with wastewater discharge permits.
- **f.** Ensure water quality is addressed in the regulatory program.
- **g.** To support HTRW efforts.

3. Organization and Staff.

District personnel involved in water quality work are listed in Table 3. All work only part-time on water quality duties.

Table 3
Little Rock District
Water Quality Staff

Name	Org. Code	Title	Phone #.	FAX #	Gra.	Exp. YRS
Gordon Bartelt (POC)	CESWL-CO-R	Hydraulic Engineer	501-324-6236	-5903	GS-12	28
Max D. Frauenthal	CESWL-PR-P	Chemical Engineer	501-324-5197	-5605	GS-12	8
Clyde P. Gates	CESWL-OP-ON	Biologist	501-324-5675	-5899	GS-12	25
Kenneth H. Lyon	CESWL-PR-R	Project Manager	501-324-5296	-6013	GS-12	23
Joyce Perser	CESWL-PR-R	Ch. Regulatory Eval	501-324-5295	-6013	GS-12	6
Tony Hill	CESWL-PR-PE	GIS Coordinator	501-324-5834	-5605	GS-12	6
Mike Rodgers	CESWL-PR-PE	Biologist	501-324-5030	-5605	GS-11	10

Table 3
Little Rock District
Water Quality Staff

Name	Org. Code	Title	Phone #.	FAX #	Gra.	Exp. YRS
Steve Robinson	CESWL-PR-R	Env. Protection Spec	501-324-5295	-6013	GS-11	27
Sheila Ellis	CESWL-OP-OM	Statistical Asst	501-324-5737	-5159	GS-06	6

4. Sampling Program.

Functional missions divide the District water quality management programs between Operations Division and Planning, Environmental, and Regulatory Division.

a. Operations Division Responsibilities. Responsibility for water quality work within the Operations Division is assigned to the various elements based on the nature of the work.

(1) Reservoir Control Branch. A water quality specialist from the Reservoir Control Branch is the District Point of Contact. This person is responsible for coordinating water quality matters within the District. The Branch is responsible for coordinating dissolved oxygen profiles at our reservoirs and release monitoring. Due to the special dissolved oxygen considerations at the White River multipurpose projects, water quality data are obtained for operational purposes. Lake profiles are taken monthly during the summer and fall months, at Beaver, Table Rock, Bull Shoals, Norfork, and Greers Ferry. This is increased to biweekly as conditions worsen, during the critical dissolved oxygen period, August through the autumnal overturn in December. Data for the profiles are taken approximately 1000 feet upstream of the dam, and includes temperature, specific conductance, dissolved oxygen and pH.

(2) Maintenance Engineering Section.

(a) Bathing Beach Monitoring. Project office personnel perform the District's bathing beach-monitoring program during the swimming season to insure safe bacterial quality of reservoir waters. Samples are taken weekly for five weeks, then once a month for the remainder of the swim season. Beginning in 1997, the Arkansas Department of Health agreed to collect baseline, pre-Memorial Day and pre-July 4th samples and all necessary re-samples. We collect routine monthly samples during the months of July, August and September. The Missouri and Arkansas Health Departments analyze samples free of charge. This program is administered in accordance with SWD Regulation 1130-2-9 and applicable State Laws.

(b) Potable Water Monitoring. Potable water supplies of the District are tested for physical, chemical, and bacterial quality. Samples are collected by project office personnel and mailed to the appropriate health departments, which perform the analyses for a nominal fee. When tests indicate a bacterial problem, corrective measures are immediately taken. In some cases chronic problems detected by this sampling cause wells to be replaced, reworked, or closed. Also, we are attempting to obtain municipal water services to replace well systems where possible. This program is conducted in accordance with ER 1130-2-407 and applicable Federal and State drinking water standards for non-community water supply systems.

b. Planning, Environmental, and Regulatory Division Responsibilities.

(1) Environmental Team. The district's lake water quality program is handled through the Environmental Team of the Planning Branch. Data collection and listing of the 12 reservoirs other than the mainstream of the Arkansas River within the Little Rock District was contracted with the private sector. There are no state or Federal programs that routinely provide these data on the reservoirs operated by the Corps. Samples for about 28 parameters at 88 stations on these multipurpose projects are performed three times during the year -- in the winter, spring and fall. Once samples are collected, the data is sent to the Corps for further analysis and record keeping. These data are used to identify pollution sources, determine water quality trends and changes in all areas of the reservoirs, and to properly manage each reservoir on an individual basis with regard to safety and water quality standards. These determinations include the identification of potential pollution sources so as to enable the Corps to have meaningful input in decision-making processes of other agencies and groups with regulatory authority over basin discharges. This program is conducted pursuant to ER 113-2-334.

(2) Regulatory Branch.

(a) Dredged Material Analysis. Periodically, a bottom sediment survey is performed at twelve locations along the Arkansas River Navigation System, and less frequently at other locations on other District rivers and reservoirs. Sediment and water column samples are collected, and sent for laboratory analyses. The purpose of this program is to detect potential effects of dredging operations on water quality, and to have these data available for the required 404(b)(1) evaluations of future Corps and private dredging. These operations include both commercial dredging under Corps permits and channel maintenance dredging performed under Corps of Engineers contract. The results are also used to update the water quality database on the Arkansas River.

(b) Special Activities. Regulatory Branch periodically conducts cooperative water quality studies with other agencies in monitoring activities authorized under Corps Section 10 and 404 permits. Regulatory Branch personnel are also involved on a daily basis with personnel from the Arkansas Department of Environmental Quality in the evaluation of Department of the Army permit applications and resolving the water quality matters arising therein.

(c) Data Management. Reservoir water quality data are entered into STORET, the computerized data management system of the EPA. The water quality data collected in conjunction with the low dissolved oxygen problem at the White River projects are stored in DSS files on SWL's WCDS computer. Results of potable water, bathing beaches, NPDES, and other monitoring are kept in computer storage, log books, or files as appropriate. Special data collection results are contained in the reports dealing with the specific subject for which the data were collected.

5. Training.

Training needs include basic training in water quality modeling and watershed management for improving water quality. Training will be scheduled if appropriate courses and funds are available.

6. Research and Development Needs.

Research needs include improved water quality models and watershed management techniques.

7. Assistance from Committees or Outside Sources.

No assistance was requested in the last FY.

8. **Project Narratives.** We have ongoing special studies and operations related to water quality at several of our 12 multipurpose reservoirs in the District.

a. White River Lakes. Lake dissolved oxygen (DO) profiles are taken monthly during summer and fall at Beaver, Table Rock, Bull Shoals, Norfork, and Greers Ferry. This is increased to biweekly as conditions worsen, and weekly during the critical dissolved oxygen period, August through the autumnal overturn in December. The profile data are used by Reservoir Control Branch personnel to monitor DO conditions in the lakes. They then regulate hydropower releases to maintain dissolved oxygen levels at 4 mg/l or greater in the releases. Data collection is done by the USGS under a contract between SWL and the Arkansas Soil and Water Conservation Commission.

Continuous recording temperature and dissolved oxygen monitors connected to Satellite Data Collection Platform's have been installed below these lakes also. They let us know how well we are doing at maintaining the DO. Another purpose of this monitoring is to evaluate mechanisms, which can provide an appropriate temperature and DO regime in releases from the lakes to meet Missouri and Arkansas State standards of 6 mg/l dissolved oxygen and a maximum temperature of 75 degrees.

In addition to the regulation of hydropower releases mentioned above, we have also made turbine modifications such as improved vent pipes, and the addition of hub deflectors at Bull Shoals and Norfork to increase airflow to the turbines. At Table Rock we are using penstock oxygen injection. These are all temporary measures that won't get the DO up to 6 mg/l. A more permanent solution to the low dissolved oxygen in hydropower releases is needed.

In an effort to find this permanent solution, personnel from the TVA, which has considerable experience with improving DO in hydropower releases at their projects, were invited to visit the projects and to help SWL determine the most reasonable aeration alternatives. A preliminary study by the Tennessee Valley Authority has lead to several proposals for permanent solutions to reach 6 mg/l DO. These include the use of reaeration weirs, autoventing turbines, oxygen injection, alone or in various combinations.

We have some problems with fecal coliforms. Occasionally, counts from a sample do exceed the recommended state maximum for body contact. These sporadic exceedences are short term. We had one beach closed at Beaver for about one week, and one at Greer's Ferry for about two weeks this past year. The closures are almost always associated with rainfall and local runoff events. Long term bathing beach sampling shows no consistent pattern or negative trends at any site.

b. White River Minimum Flows. The White River Basin in Arkansas and Missouri contains five Corps multiple-purpose lakes: Beaver, Table Rock, Bull Shoals, Norfolk, and Greers Ferry. Section 374 of WRDA ’99 modifies the authorization of these projects to include specific amounts of project storage to provide minimum flows to sustain natural reproduction in the trout fishery. Prior to this authorization, water management decisions affecting lake levels and downstream flows were based primarily on flood control and hydropower needs. WRDA 99 directs the Corps to reallocate the following amounts of storage: Beaver Lake, 1.5 feet; Table Rock Lake, 2 feet; Bull Shoals Lake, 5 feet; Norfork Lake, 3.5 feet; and Greers Ferry Lake, 3 feet. The stored water will be used to make releases during periods when hydropower is not being generated. These minimum flows are intended to sustain the trout fishery. These changes cannot be carried out until this study determines that this work is technically sound, environmentally acceptable, and economically

justified. The Corps under Section 216 of the Flood Control Act of 1970, reevaluation of completed projects, reprogrammed $100,000 of O&M funding to initiate the study effort. The Corps has used these funds for conducting public involvement activities of the study. The Corps is also having meetings with both state fisheries agencies and the Southwestern Power Administration. In FY 2001 $487,000 was received to initiate the study. The study is ongoing.

c. **Beaver Tailwater Restoration.** The project area is located immediately below Beaver Dam along the White River in Carroll County, Arkansas. The modification consisted of restoring 2 miles of channel and banks of the upper White River damaged by high flows from Beaver Lake releases. The modification included stabilizing the banks with riprap, log cribs and bank vegetation; re-establishing the primary river channel by placing boulders and stone revetments in the stream; and improving habitat by placing root wads, logs, and boulders in the stream. The cost to implement the project was $120,000 and was cost-shared 75% Federal and 25% with the local sponsor, the Arkansas Game & Fish Commission (AGFC). AGFC provided their contribution of $11,800 in cash and $18,200 in work-in-kind services, including providing boulders and logs for 60 in-stream habitat structures, cedar trees and logs for three retaining walls, and boulders for one stone weir. Contract award was November 14, 2000. Construction was completed February 27, 2001, and the project was officially transferred to AGFC on March 20, 2001.

d. **Nimrod Fisheries Restoration.** The project area is on Nimrod Lake located near Plainview, AR, in Yell County, on the Fourche LaFave River. The proposed modification consisted of the selective planting of willow and buttonbush vegetation along approximately 100,000 linear feet of the shoreline, and the placement of 35 fish shelters constructed from the culled trees on project lands to provide necessary fish habitat. A water level manipulation plan was implemented that allows for the survival and regeneration of shoreline vegetation necessary in the life cycle of many fish species in the lake. The total cost of the project was estimated to be $106,800, of which the Federal share is $80,100, and the non-Federal share is $26,100 consisting of $5,400 in cash and $21,400 in work-in-kind services. Construction was completed March 13, 2000. The project was turned over to the local sponsor, the Arkansas Game & Fish Commission, on March 28, 2000.

e. **Fourche Bayou Basin**. The Army Corps of Engineers and local non-federal sponsors worked to construct a flood reduction project in Little Rock's Fourche Bayou Basin, which was the scene of repeated urban flooding and loss of life. Project features included channel clearing and enlargement of segments of Grassy Flat, Rock and Fourche creeks, as well as road and railroad bridge alterations and recreation features. Construction is complete, and the project has been transferred to the city of Little Rock.

The project authorization also included acquiring 1,750 acres of bottomlands for environmental restoration with nature appreciation facilities. The 1,750 acres of bottomlands also provide flood control storage. A limited reevaluation report (estimated cost $480,000) is being prepared as the decision document used by the Assistant Secretary of the Army for Civil Works to determine whether to budget for the acquisition and nature facilities. The report is scheduled for completion in the second quarter of FY03. The project is estimated to cost another $1.8 million.

f. Release Modifications at the Tri-Lakes. Low-flow structures at Gillham, De Queen, and Dierks reservoirs release surface water, when the reservoirs are stratified, to help maintain warm water fisheries downstream. To reduce sudden temperature changes on the fishery, small changes in release rates are made when mixing warm water from the low-flow structures and cold water from the conduit. This procedure, which requires a large number of gate changes, occurs during the transition from low flow to flood releases and vice versa.

g. No water quality operations other than the routine sampling described in (1)(b) above occurred at Blue Mountain, Clearwater reservoirs. Millwood Reservoir had swim beaches closed because of fecal coliforms several times. This is not unusual for this lake since it is located in an agricultural area. Long term bathing beach sampling shows no negative trend at any site.

SECTION V

WATER QUALITY ACTIVITIES IN TULSA DISTRICT

SECTION V - WATER QUALITY ACTIVITIES IN TULSA DISTRICT

1. Program Summary and Responsibilities.

Historically, water quality studies performed by District personnel fall under three categories: baseline, monitoring, and special studies. Baseline studies are designed to collect a large amount of data over a short period of time, usually April through October, what is generally considered the growing season. Monitoring programs are long-term, measure fewer parameters than baseline studies, and are tailored to the data needs of each lake. Special studies are those which are generally funded by special Congressional appropriation or by other agencies. In FY 01, personnel in the Environmental Analysis and Compliance Branch (EACB) were responsible for the overall water quality program in the District. They developed sampling plans, wrote scopes of work, collected water samples and field data, performed sample analyses, and managed data. In addition, they were responsible for data analysis and report writing. Other responsibilities included ordering materials and supplies, maintaining water quality instruments, and providing water quality information to interested parties.

2. Goals.

The goals of the program are to (1) complete one baseline study at each lake that characterizes existing water quality and provides a data set for comparison with future studies, (2) develop monitoring programs to track changing water conditions and guide future lake management decisions, (3) conduct special studies to the satisfaction of project proponents, and (4) coordinate annual programs with interested State agencies and local organizations.

3. Organization and Staff.

In FY 01, 1.5 FTEs in Planning, Environmental, and Regulatory Division were devoted to the water quality program. These FTEs are located in the Environmental Analysis & Compliance Branch. District personnel involved in water quality work are listed in Table 4.

Table 4
Tulsa District
Environmental Analysis & Compliance Branch
Organization & Staff

Name	Org. Code	Title	Phone #	FAX #	Gra.	Exp. YRS
John Carroll	CESWT-PE-E	Limnologist	918-669-7659	-7546	GS-12	29
Steve Nolen	CESWT-PE-E	Limnologist	918-669-4359	-7546	GS-12	16

4. Sampling Programs.

Sampling programs are developed specifically for each lake being studied. For baseline studies, fixed sites are located in key areas (e.g., dam site, mid-lake, upper lake, coves with pollution source, and if possible, the stilling basin). A minimum of three sites per lake is established. Vertical profiles of dissolved oxygen, water temperature, pH, and conductivity are measured at each site on each sampling trip. Secchi disk transparency and turbidity are also measured each time. In addition, water samples are collected at the surface and about one meter above the bottom for analysis of several parameters, including nutrients (phosphorus and nitrogen series), total metals, and other inorganic parameters (alkalinity, hardness, chloride, sulfate). Chlorophyll a is also measured at each site except the stilling basin.

For monitoring programs, a somewhat different approach is taken. Monitoring studies are long term in nature (3+ years), but fewer key parameters are measured. Sampling sites can be fixed or random, depending on the nature of the study. The main purposes of monitoring are to track changing water conditions for key parameters and to guide future lake management decisions.

Special studies are designed and conducted according to goals specific for the project.

5. Training

Steve Nolen attended a CE-QUAL-W2 (the Corps' reservoir hydrodynamic and water quality model) workshop in September 2001.

6. Research and Development Needs.

None are anticipated in the next FY.

7. Assistance from Committees or Outside Sources.

Dr. Jim Schooley, Professor of Biology, Northeastern State University, Tahlequah, assisted

EACB personnel under an IPA agreement. He assisted in evaluating water quality data and preparing water quality reports, in addition to advising on special projects.

Dr. Myron Cherry, Professor of Chemistry, Northeastern State University, Tahlequah, assisted EACB personnel under an IPA agreement. He used his experience and training in chemistry and instrumentation to provide guidance in sample preparation and analysis using the fluorometer for chlorophyll detection on site. He also reviewed and refined chemical analyses for nutrients and other lake parameters.

Dr. Robert Lynch, Associate Professor of Health Sciences, University of Oklahoma, Norman, assisted EACB personnel under an IPA agreement. He identified phytoplankton collected in water quality studies from several District lakes

.

8. <u>Project Narratives</u>.

(1) Baseline Studies.

The field work for baseline studies was completed at Arcadia and Eufaula Lakes in Oklahoma. Data have been put on spreadsheets and will be formatted for entry into the EPA STORET national water quality data system. Water quality reports on each of these lakes should be completed by Spring of 2002. In addition, starting in FY01, all Tulsa District water quality data are being input to DASLER, a water quality database developed for the Corps of Engineers.

A Congressionally-funded special study aimed at evaluating water quality concerns in Oologah Lake, Oklahoma, was continued. This special study is being administered by the Tulsa District with assistance from the City of Tulsa. Owing to recent concerns expressed by water supply users, initial phases of the study were aimed at evaluating potential water quality-related threats from: (1) excessive sedimentation and inorganic turbidity, (2) petroleum-related contaminants, and (3) excessive nutrient loading. Activities during the first year included extensive in-lake data collection for problem identification, definition of lake bathymetry, monitoring of major tributaries for load estimation, set-up and application of a predictive water quality model (CE-QUAL-W2). A report of findings for the first year was completed in April, 2001. The second year of study continued throughout FY01 and integrated watershed modeling into study design.

A second Congressionally-funded special study was initiated during FY 01 at Wister Lake, Oklahoma. This study is addressing concerns of degraded aquatic habitat, high suspended solids, elevated nutrients, and undesirable vertical regimes of temperature and dissolved oxygen. The study is being conducted with cooperation from the Oklahoma Water Resources Board.

(2) Water Quality Reports.

Baseline water quality reports were completed for Kaw, Keystone, and Great Salt Plains Lakes in Oklahoma. These reports describe existing water quality and discuss potential problems.

(3) Monitoring Programs.

(a) Broken Bow Lake, OK.

The fifth year of a monitoring program was completed at Broken Bow Lake. The purpose of this program is to identify water quality trends in the lake, with the emphasis on the potential for increased eutrophication rates because of watershed activities. The five years of data will be evaluated to determine what future actions might be needed to maintain the high quality of the lake water.

(b) Lake Texoma, OK & TX.

Continuing studies are being conducted at Lake Texoma by the University of North Texas, Denton. This program is a part of planned environmental studies related to the proposed chloride control plan above Lake Texoma. In addition to the above monitoring program, Tulsa District personnel are also working with EPA, other Federal and State agencies, and local universities on a basin-wide study of contaminant sources and potential effects of these contaminants on the system assimilative capacity of the lake. This portion of the project is funded by the USEPA.

(c) Lake Kemp, TX.

The third year of a water quality monitoring program was conducted at Lake Kemp by Texas Tech University, Lubbock. The purpose of this program is to obtain baseline water quality data associated with the Wichita River Basin Project.

(d) Canton Lake, OK.

The third year of a water quality monitoring program was conducted at Canton Lake by District personnel. This program was in cooperation with the Oklahoma Water Resources Board, acting at the request of the city of Oklahoma City. Oklahoma City has water supply in the lake and periodically requests water supply releases.

(e) Tenkiller Lake, OK.

The first year of a water quality monitoring program is being conducted by District personnel. The purpose of this program is to develop data to look at trends relating to eutrophication rates and water clarity.